UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 08/905,971 | 08/05/1997 | KAZUYUKI TOYODA | 2342-0111P | 6177 |

2292 7590 07/01/2002

BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

| EXAMINER |
|---|
| ZERVIGON, RUDY |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1763 | 22 |

DATE MAILED: 07/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

MF=22

| Office Action Summary | Application N . | Applicant(s) | |
|---|---|---|---|
| | 08/905,971 | TOYODA ET AL. | |
| | Examiner | Art Unit | |
| | Rudy Zervigon | 1763 | |

*-- The MAILING DATE of this communication appears on the c ver sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *15 April 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disp sition of Claims**

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Pri rity under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☒ Interview Summary (PTO-413) Paper No(s). *22* .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1-4, 7-16, 20-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tateishi et al (U.S. Pat. 4,405,435) in view of Mikio Takagi (Pub. No. 2-152251; IDS Paper 6 Document). Tateishi et al describe a substrate processing apparatus (Figure 4) where component chambers are each hermetically configured (column 1, lines 35-45) and exhibit the following attributes:

i. a substrate transfer section embodied by Tateishi et al here as item 52 or 53, Figure 4 (column 5, lines 40-55)

ii. a module (items 52-54, Figure 4,3; column 5, lines 40-55) embodied here by Tateishi et al as processing chambers for processing substrates as first and second intermediate processing or treatment chambers (items 52-55 Figure 4; column 5, lines 40-55) for processing substrates (3).

iii. first substrate transfer means embodied by Tateishi et al as item 62 of Figure 4 (column 5, lines 55-68) provided inside

iv. a substrate transfer section (items 52 or 53, Figure 2) capable of transferring a substrate within the module

v. a first valve (items 64, Figure 4; 71, Figure 6) capable of establishing hermetic (column 2, lines 43-63) isolation between the processing chambers for processing substrates (items 3, all Figures; column 1, lines 45-50) and a plurality of chambers embodied by Tateishi et al as first and second intermediate processing or treatment chambers (items 52-55 Figure 4; column 5, lines 40-55) when the first valve is closed and allowing a substrate to pass through when opened

vi. a second valve (item 71, figure 4) capable of establishing hermetic (column 2, lines 43-63) isolation between the first and second intermediate processing or treatment chambers (items 52-55 Figure 4; column 5, lines 40-55) and a substrate transfer section embodied by Tateishi et al here as item 52, Figure 4 (column 5, line 53) when the second valve is closed and allowing a substrate to pass through when opened

vii. a third valve (item 77, figure 4) capable of establishing hermetic (column 2, lines 43-63) isolation between the first and second intermediate processing or treatment chambers (items 52-55 Figure 4; column 5, lines 40-55) and a substrate transfer section embodied by Tateishi et al here as item 52, Figure 4 (column 5, line 53) when the third valve is closed and allowing a substrate to pass through when opened

viii. first and second intermediate processing or treatment chambers additionally are provided with second substrate transfer means (item 67, Figure 4; column 6, lines 16-30) capable of transferring a substrate to a processing or treatment chamber.

ix. all component chambers are each hermetically configured (column 2, lines 43-63) and can be independently reduced in pressure (items 69, 76, 112, 8, Figure 6, column 6, line 33 - 45). Motivation for such design is additionally provided (column 6, line 33 - 45).

x. an intermediate chamber (item 52 or 53, Figure 4) supporting substrate holding means (items 65 or 72, Figure 4) positioned closer to the substrate transfer section (items 52, Figure 4) than the second substrate transfer means (item 78, Figure 4)

xi. Tateishi et al describe cassette holding means accommodating a plurality of substrates (Items 63,68,75; column 5, lines 55-65) where the first substrate transfer means is capable of transferring a substrate between the cassette and plurality of chambers.

xii. Tateishi et al describe a first substrate transfer means structure capable of transferring a wafer cassette (item 67, Figure 4; column 6, lines 16-30).

xiii. Tateishi et al specifically describe a cassette introduction section whose height is different from the height of the cassette holding means (all Figures). Tateishi et al describe processing a plurality of substrates simultaneously

xiv. Tateishi et al specifically describes transferring and processing a single wafer at a time (Figure 7; column 17, lines 14-21)

xv. Tateishi et al do not expressly describe modules piled up separately in a substantially vertical direction. Tateishi et al do not expressly describe varying the number (one or more) of transferred and/or processed substrates.

xvi. Mikio Takagi describes a manufacturing system of vertical-type semiconductor (title, JPO abstract). Specifically, Mikio Takagi describes "...a process chamber installed in each stage position of a space positioned in an up-and-down direction..." in order to "..reduce a floor area and to easily install more systems...". Thus the Mikio Takagi reference supports a substrate processing apparatus hermetically configured exhibiting modules piled up separately in a substantially vertical direction. Mikio Takagi additionally describes all component chambers each hermetically configured and can be independently reduced in pressure (abstract, "Individual process chambers are evacuated in advance to a prescribed pressure by using individual pumps 3"). Mikio Takagi additionally provides for an elevator capable of vertically moving a first substrate transfer means (items 11, 14; constitution).Mikio Takagi additionally provides for an elevator capable of vertically moving a first substrate transfer means (items 11, 14; constitution). Component chambers are each hermetically configured (certified STIC translation, page 5, second paragraph) and exhibit the following attributes:

xvii. a substrate transfer section embodied by Mikio Takagi here as item 14, Figure 1, (certified STIC translation, page 12, 3rd paragraph)

xviii. a plurality of detachably (first paragraph, page 11) attached modules (items 14/2/3, Figure 1; certified STIC translation, pages 10-12) and a plurality of modules embodied by Mikio Takagi as processing or treatment chambers (items 2, Figure 1; certified STIC

translation, pages 10-12) for processing substrates - The modules are capable of being attached to and detached from the substrate transfer section (page 11, 1st paragraph)

xix. first substrate transfer means embodied by Mikio Takagi as item 14 of Figure 1 (certified STIC translation, pages 10-12) provided in

xx. a substrate transfer section (item 14, Figure 1) capable of transferring a substrate to the plurality of modules

xxi. a first valve (items 12, figure 1) capable of establishing hermetic (certified STIC translation, page 5, second paragraph) isolation between the processing chambers for processing substrates and a plurality of modules where the first valve is closed and allowing a substrate to pass through when opened (certified STIC translation, page 12, last paragraph)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tateishi et al substrate processing apparatus by implementing the Mikio Takagi substrate processing apparatus hermetically configured exhibiting modules piled up separately in a substantially vertical direction.

Motivation for such design alteration of the Tateishi et al substrate processing apparatus is provided by Mikio Takagi. Specifically, "To reduce a floor area and to easily install more

systems (..."modules being detachable attached...")" which is centered on reducing the clean room foot print in order to reduce operating costs ("Purpose" of IDS document abstract.)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the number (one or more) of transferred and/or processed substrates.

Motivation for varying the number (one or more) of transferred and/or processed substrates is drawn from larger manufacturing throughput of the claimed apparatus.

1. Claims 5, 6, 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tateishi et al (U.S. Pat.4,405,435) as applied to claims 1-4, 7-16, 20-36 above, and further in view of Hideki Lee (U.S. Pat. 5,616,208). Tateishi et al do not describe processing substrates under atmospheric pressure through a substrate transfer section. Hideki Lee describes a vacuum processing apparatus including a plurality of vacuum processing chambers (column 9, lines 19-34). Specifically, Hideki Lee describes processing substrates serially and under atmospheric pressure (column 10, lines 32-42) through a substrate transfer section (items 20, 21, Figure 8). Additionally, Hideki Lee (column 5, lines 1-14), describes processing substrates in a substrate processing chamber (items 1,2, and 3, Figure 8) under reduced pressure (column 9, line 24).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tateishi et al multichamber processing apparatus whereby substrates are transferred through a substrate transfer section (items 20, 21, Figure 8) while sustaining atmospheric pressure as is taught by Hideki Lee.

Motivation for processing substrates that are transferred through a substrate transfer section (items 20, 21, Figure 8) while sustaining atmospheric pressure during the transfer is centered on selecting where, in the processing of the substrate, the reactant gas will be introduced. Such selection is within the independent pressure control as exhibited by the references and encompassed within the level of ordinary skill in view of the cited references.

2. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tateishi et al (U.S. Pat. 5,186,718) as applied to claims 1-4, 7-16, 20-36 above, and further in view of Shunpei Yamazaki (U.S. Pat. 4,582,720). Tateishi et al describe an intermediate chamber (item 24, Figure 1) supporting substrate holding means (item 40, Figure 1) positioned closer to the substrate transfer section (items 21, Figure 1) than the second substrate transfer means (item 42, Figure 1,2,3a,3b,4a,4b). However, Tateishi et al does not specifically describe an intermediate chamber supporting heat-resistant substrate holding means positioned closer to the substrate transfer section than the second substrate transfer means. Because the Tateishi et al apparatus plasma processes the substrate in later chambers (items 34, Figure 1), this may imply that there is

no heat resistance imparted to the intermediate chamber substrate holding means. The structural characteristics of Shunpei Yamazaki's plasma assisted chemical vapor deposition apparatus (column 2, lines 13-21) is in many respects identical to the presently claimed apparatus. The primary difference between the presently claimed invention at that of Shunpei Yamazaki's plasma assisted chemical vapor deposition apparatus is the orientation of the device itself. The presently claimed invention has its long axis (processing direction vector) parallel to the gravity vector while the long axis (processing direction vector) of the Shunpei Yamazaki apparatus is perpendicular to the gravity vector. Specifically, Shunpei Yamazak describes a substrate transfer section (item A, Figure 1), an intermediate chamber (item B, Figure 1), and a final processing chamber (item C, Figure 1). An intermediate chamber (item B, Figure 1), supports heat-resistant substrate holding means (item 70, Figure 1) used in the intermediate processing chamber under a heated plasma process (column 5, lines 17-25; lines 55-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to enhance the Tateishi et al intermediate chamber (item 24, Figure 1) supporting substrate holding means (item 40, Figure 1) positioned closer to the substrate transfer section (items 21, Figure 1) than the second substrate transfer means (item 42, Figure 1,2,3a,3b,4a,4b) by employing heat-resistance as taught by Shunpei Yamazaki's plasma assisted chemical vapor deposition apparatus.

Motivation for employing heat resistance to the substrate holding means (item 40, Figure 1) is drawn from the fact that plasma generating apparatus commonly operate at elevated temperatures.

***Response to Arguments***

3. Applicant's arguments filed April 15, 2002 have been fully considered but they are not persuasive.

4. Applicant's representative Carolyn Baumgardner and Examiner Zervigon conducted an interview on June 20, 2002 where we discussed the filed request for reconsideration that is herein replied to. The interview summary is provided herewith. In the interview, the Examiner suggested adding structural limitations centered on how the vertically stacked chambers are detachably detached. Such teaching is not present in the references of record.

5. The April 15, 2002 submission contends that Tateishi does not teach "a plurality of items 54 or items 52-55. There is only one chamber 54 and one chamber 53, one chamber 54 and one chamber 55, which means that there are no plurality of chambers which can be regarded as the plurality of modules as set forth in the present invention." The Examiner concedes that Tateishi only teaches one of the plurality of modules as described above, and relies on the teachings of Mikio Takagi to provide motivation for Tateishi to reproduce and orientate the plurality of stacked modules as claimed. To further clarify the Examiner's interpretation of the Tateishi reference, the Examiner sites Applicant's Figure 1B which shows 52 as a load lock chamber, 54

as a substrate transfer chamber, and 56 as a processing chamber. The Examiner cites Tateishi's Figure 4 as teaching 52 as a load lock chamber, 53 as a substrate transfer chamber, and 54 as a processing chamber where the collective items 52-54 are a "module" as claimed. Further, that first substrate transfer means embodied by Tateishi et al as item 62 of Figure 4 (column 5, lines 55-68) is supported as being provided inside a substrate transfer section (items 52 or 53, Figure 2) capable of transferring a substrate within the module is directly analogous to Applicant's Figure 1B.

6. Regarding the interpretation of Takagi's page 11 1st paragraph translation by the STIC resources, "does not mean that chambers (2) and pumps (3) are detachably attached.", is appreciated, however, Takagi's statement that "their numbers can be adventitiously [understood as advantageously] selected in consideration of the number of required processes" - implies that the chambers (2, Figure 1) are detachably attached.

7. With regards to Applicant's position that the Examiner cites item 14 of Takagi's Figure 1 as both a substrate transfer section and a plurality of modules is not correct according to the Examiner's original statements:

"

a plurality of detachably (first paragraph, page 11) attached modules (items 14/2/3, Figure 1; certified STIC translation, pages 10-12) and a plurality of modules embodied by Mikio Takagi as processing or treatment chambers (items 2, Figure 1; certified STIC

"

As seen by Figure 1 of Takagi, item 2 surrounds/collects all items 14, 12, 5, 6, and 10 and connects directly to item 3.

8. With regards to Applicant's position that the certified STIC translation is in error, Applicant is advised that the STIC translation is consistent with Takagi's Figure 1 as a side view of Figure 2, as top view, which have identical numbers for corresponding parts. See especially item 14 and its containment within a chamber as a darkened lined surrounding the transfer means both vertically (Figure 1) and horizontally (Figure 2).

9. As a result of the June 20, 2002 interview, Applicant's representative sent a draft amendment by facsimile that the Examiner has reviewed and considered on the merits. However, the amendment does not provide additional structural limitations centered on how the vertically stacked chambers are detachably detached which was noted in the interview as a facet that is not present in the prior art of record. The draft amendment is not entered, but is placed in the file.

***Conclusion***

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 872-9311. The official before final fax phone number for the 1763 art unit is (703) 872-9310. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.

GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700